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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/611,955	07/06/2000	Cyprian Emeka Uzoh	FI9-97-205B	6678
32074	7590	03/07/2007	EXAMINER	
INTERNATIONAL BUSINESS MACHINES CORPORATION			VU, HUNG K	
DEPT. 18G			ART UNIT	PAPER NUMBER
BLDG. 300-482			2811	
2070 ROUTE 52				
HOPEWELL JUNCTION, NY 12533				
SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE		
2 MONTHS	03/07/2007	PAPER		

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/611,955

Filing Date: July 06, 2000

Appellant(s): UZOH ET AL.

Burton A. Amernick
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/20/06 appealing from the Office action mailed 05/16/06.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner. The rejection of claims 25-32 under 35 USC 112 has been withdrawn.

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,821,168	JAIN	10-1998
4,577,395	SHIBATA	3-1986
6,329,284	MAEKAWA	12-2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 25 and 28 – 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain (PN 5,821,168) in view of Shibata (PN 4,577,395).

Jain discloses, as shown in Figure 10, a semiconductor structure comprising:

a substrate (26,54);

a recess (72) located in at least one major surface of the substrate;

an electrical insulating layer (56) located over the at least one major surface and in the recess;

a conductive barrier (TiN disclosed in Col. 5, lines 38-43) located over the insulating layer in the recess and over at least one major surface;

a seed layer (60) located over the conductive barrier within the recess only;

a conductive metal (62) in the recess only (see Figure 9). Note that at the final structure, the seed layer and the conductive metal layer (74) is in recess only.

Jain does not disclose the semiconductor structure is formed in a semiconductor substrate.

However, Shibata discloses a semiconductor structure (memory device) is formed in a semiconductor substrate (10). Note Figures 1G, 3G, 5G, 6G and 7G of Shibata. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor structure of Jain in the semiconductor substrate, such as taught by Shibata in order to increase the packing density with the formation of a plurality of structures.

Note that the term “plating” is method recitation in a device claimed. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 28, Jain and Shibata disclose the seed layer is copper (Col. 4, line 14).

Regarding claim 29, the term “sputtered” is method recitation in a device claimed. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 30, Jain and Shibata disclose the copper is approximately 50 – 150 Å thick (within the range of about 100 to about 2000 Å) (Col. 4, lines 14-20).

Regarding claim 31, Jain and Shibata disclose the conductive metal is copper (Col. 4, lines 28-29).

Regarding claim 32, Jain and Shibata disclose the conductive metal is about 6000 Å to 15,000 Å thick (within the range of 4000 Å to 30,000 Å) (Col. 4, lines 28-29).

2. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain (PN 5,821,168) in view of Shibata (PN 4,577,395) and further in view of Maekawa (PN 6,329,284).

Regarding claim 26, Jain and Shibata disclose the claimed invention including the semiconductor structure as explained in the rejection above. Jain and Shibata further disclose the formation of the barrier layer. Jain and Shibata do not disclose the barrier layer comprises a layer of tantalum nitride adjacent the insulating layer and a layer of tantalum above the tantalum nitride layer. However, Maekawa discloses a semiconductor structure having a barrier layer (5) comprises a layer of tantalum nitride adjacent an insulating layer (3) and a layer of tantalum above the tantalum nitride layer. Note Figures 7-10 and Col. 5, lines 44-58 of Maekawa. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the barrier of Jain and Shibata comprising a tantalum nitride layer and a tantalum layer above the tantalum nitride layer, such as taught by Maekawa in order to provide a better adhesion between the conductive metal and the insulation layer.

Regarding claim 27, Jain, Shibata and Maekawa disclose the tantalum nitride layer is about 15 to about 500 Å thick and the tantalum layer is about 500 to about 5000 Å thick (Col. 5, lines 44-58).

(10) Response to Argument

In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). As in this case, Jain discloses the semiconductor structure couple to the gate electrode 40. Shibata discloses a semiconductor structure (trench memory capacitor) also coupled to the gate electrode 36a, 36b. Jain does not disclose the semiconductor structure is formed in a semiconductor substrate, and Shibata discloses the semiconductor structure (trench memory capacitor) is formed in a semiconductor substrate. Therefore, one of skill in the art would be motivated to form the structure of Jain in the semiconductor substrate, such as taught by Shibata in order to increase the packing density with the formation of a plurality of structures.

Appellant argues that the presence of a layer of tantalum nitride and a layer of tantalum as recited in claim 27 would not be present in Jain because of the process required by Jain which involves nitriding of the oxide dielectric, so that to include layer of tantalum nitride and a layer of tantalum as mentioned by Maekawa would be contrary to the stated objections of Jain and therefore not an obvious modification. This argument is not convincing because Appellant argues about the different layer (layer 56) than the one that the examiner used (supplementary diffusion barrier layer. In fact, Jain discloses, as shown in Col. 5, lines 38-43, a supplementary diffusion barrier layer, such as a titanium nitride layer and the like, may be formed, but does not

discloses the supplementary diffusion barrier layer is a combination of TaN and Ta. Maekawa discloses it is possible that a barrier layer is formed of Ti, Ti/TiN/Ti, Ta, nitride of Ta, a composite film formed by stacking them (TaN/Ta). Therefore, one of skill in the art would be motivated to form the barrier of Jain comprising TaN and Ta in order to provide better adhesion between the conductive metal and the insulation layer.

In response to appellant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Hung Vu

Hung Vu

Conferees:

Richard Elms 

Darren Schuberg 

Hung Vu 